Progress Report 2015

ENERGY STRATEGY FOR YUKON

Yukon Government

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Executive summary

This is the third progress report since the 2009 release of the *Energy Strategy for Yukon*. It is an account of the Government of Yukon's substantial progress toward ensuring a sustainable and secure energy sector that meets Yukon's energy needs now and in the future. The *Energy Strategy for Yukon* focused on four priorities for energy in Yukon: renewable energy, energy efficiency, meeting electricity needs and managing responsible oil and gas development. The following pages show how the Yukon government is achieving its targets and goals for these four priorities.

Note that progress on meeting our electricity needs is woven into the renewable energy and energy efficiency targets and as such is described in those sections of the report. This report also proposes further steps to continue to lead us beyond our targets as our energy requirements increase.

Renewable Energy:

Substantial progress has been made in our continuing effort toward increasing Yukon's renewable energy supply. The increase to date has largely come from the addition of new hydro-electric generation, but significant progress has also been made in the heating sector both in Yukon residences and in Yukon government buildings.

The Yukon government is working on several fronts to increase renewable energy supply. This includes offering incentives through the *Good Energy* program (wood/pellet heating systems have made a significant impact), installing two major biomass heating systems; building capacity in solar energy generation and conducting research in prospective wind sites.

Two primary government policy tools that will help meet the goals for increased renewable energy production are the Independent Power Production (IPP) Policy and the Biomass Energy Strategy for Yukon.

Energy Efficiency:

The 2009 *Energy Strategy for Yukon* set a target of increasing energy efficiency in Yukon by 20% by 2020. Progress toward this target is being made, as shown by an increase in the Yukon government vehicle fleet's fuel efficiency, and a doubling of the *Good Energy* rebate program's energy savings since the program began eight years ago.

The Energy Branch[1] has undertaken two major new expansions to its *Good Energy* rebate program: The Residential Energy Incentive, which launched January 1, 2015 and the Commercial Energy Incentive which launched May 1, 2015. In its first six months the Residential Energy Incentive has seen 34 new homes being built to EnerGuide 85 or better, resulting in estimated annual thermal energy savings of 176,800 kWh and annual cost savings of $30,600. In its first summer the Commercial Incentive has resulted in upgrades to LED lighting in 10 commercial buildings, including hotels, a curling rink and a vehicle service centre. These upgrades represent an approximate annual energy savings of 1,188,000 kWh and an annual cost savings of $142,500.

[1] In Fiscal Year 2014/15 the Energy Solutions Centre became the Energy Branch, acknowledging its formal position in the Yukon government and its evolving role in facilitating the energy future of Yukon. It continues to retain the Energy Solutions Centre storefront where it works directly with the public.

Oil and Gas:

The 2009 *Energy Strategy for Yukon* set a goal to support the development of Yukon oil and gas resources for local use within Yukon and for export in a way that brings economic and environmental benefits to Yukoners. In order to compete with other jurisdictions, Yukon will promote exploration and production through a streamlined regulatory regime, collection of more baseline data, and increased public engagement on the benefits of responsible resource development.

Yukon has a mandate to negotiate a deal with Canada on shared management and revenues for offshore oil and gas. Development of offshore oil and gas could bring large socio-economic benefits to Yukon. From 1978 to 2012, gas from the Kotaneelee wells generated almost $46 million in royalties. Additionally, over $100 million have been spent by oil and gas companies on exploration projects, with over $20 million of that money creating direct socio-economic benefits for Yukoners. Four exploration wells have been drilled in Eagle Plain basin since 2009 and there is currently a proposal to drill up to 20 new wells in the same area.

The Oil and Gas Resources (OGR) branch of the Yukon government has been continually developing and modernizing oil and gas regulations to achieve clarity, certainty, and transparency.

Next Steps:

The 2009 *Energy Strategy for Yukon*, through its 53 stated "Priority Actions", has provided valuable guidance to energy policy development and energy management in Yukon for the past six years. This guidance has helped the Yukon government to make steady and substantial progress towards its targets and goals. As the Yukon government looks to the future it will be important for us to continue with implementing most of these priority actions as well as to develop new initiatives for areas of interest that have emerged since 2009.

Introduction

This is the third progress report since the 2009 release of the *Energy Strategy for Yukon*. It is an account of the Government of Yukon's progress towards the vision stated in the Strategy:

> *Yukon will have a sustainable and secure energy sector that is environmentally, economically and socially responsible; developing and using energy resources to meet Yukon's energy needs and generating benefits for Yukon people, both now and for generations to come.*

The vision sets the context for the Yukon government's work in the energy sector and is based on the principles of sustainability, security, self-sufficiency, and long-term environmental and socio-economic profitability.

The following pages show how the Yukon government is realizing this vision through achieving its renewable energy and energy efficiency targets, meeting electricity needs and managing responsible oil and gas development.

Our target: Renewable Energy

The 2009 *Energy Strategy for Yukon* set a target of increasing renewable energy supply in Yukon by 20% by 2020.

There are currently two primary influences on renewable energy supply (availability and consumption) in the territory: electricity production and building heating. The majority of the Yukon's electricity production comes from renewable hydro generation with a small percentage being produced from wind generation and non-renewable thermal generation. Wood based heating comprises a significant percentage of the territory's building heating demand.

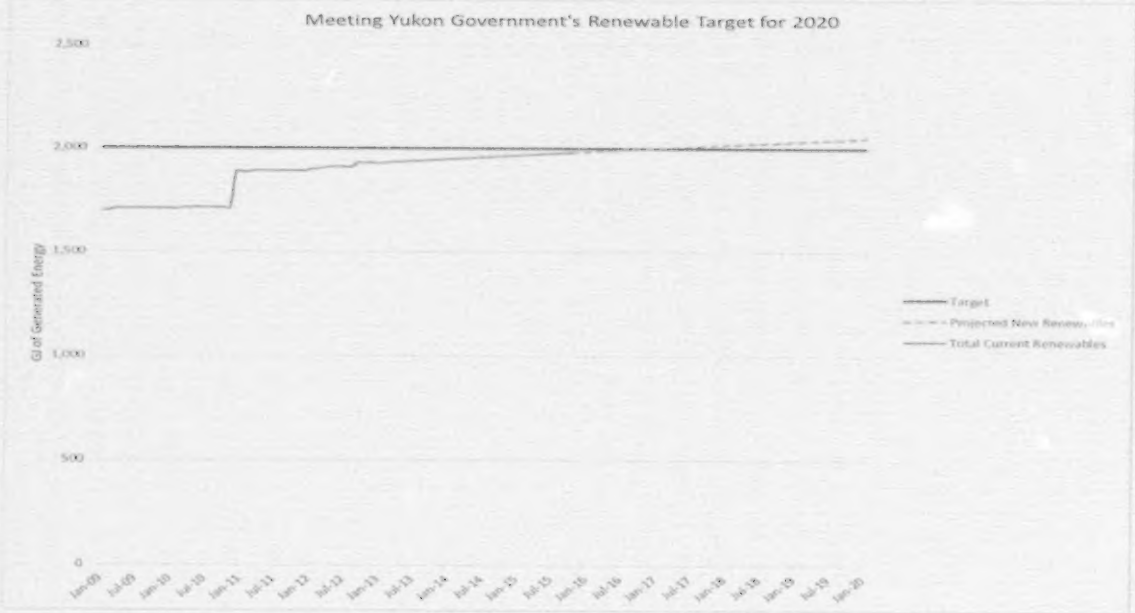
The estimated total renewable electrical generation in the base year of 2009 was approximately 1300 TJ (YEC Annual Reporting). For the same year, the estimated cord wood and wood pellet energy consumed for heating was approximately 400 TJ (Calculated estimate based on Yukon Housing Corporation's 2001 "Community Housing Survey"). These two figures give a total renewable energy generation for the base year of approximately 1700 TJ, leading to the target figure of 2,000 TJ per year by 2020.

How are we meeting the target?

The Yukon government has made substantial progress in meeting its target to increase renewable energy in the territory by 20% by 2020. As of mid-2015, the territory's total renewable generation had increased to approximately 2,000 TJ/year -- thus meeting our target five years ahead of schedule.

Figure 1 shows that the bulk of this increase occurred in 2011 and 2012.

Figure 1. Estimate of Current Progress and Projection of Required New Projects



This increase largely came from the addition of new hydro-electric generation, which has increased by 17 MW in name plate capacity (maximum rated output) since 2009. The territory's electrical generation from renewable energy has increased by approximately 184 TJ as a result of the development of both the Mayo B hydro facility and the addition of a third hydro turbine at the Aishihik hydro facility. These facilities represent an increase to the territory's electrical capacity of approximately 22%. These systems have the potential to add an additional 13 TJ of renewable electricity to the grid, as required, for a total increase of approximately 200 TJ.

In addition to the electrical sector some significant progress has been made in the heating sector both in Yukon residences and in Yukon government buildings.

Through its *Good Energy* rebate program, the Yukon government has incentivized the purchase of 629 clean burning wood and pellet heating appliances and solar water heaters. The wood and pellet heaters represent an estimated additional 37 TJ of renewable energy production.

Figure 2. Good Energy Renewable Energy Product Rebate Summary

Renewable Heating System Rebates	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	Total
Wood Stoves	131	63	66	60	49	69	91	529
Pellet Stoves	14	5	10	12	18	8	23	90
Solar Thermal Water Heaters	n/a	3	2	1	1	1	2	10
Total	145	71	78	73	68	78	116	629

In addition to this increase in residential renewable energy heating the Yukon government has installed two large scale biomass heating facilities in the territory: one at the new Whitehorse Correctional Centre (950 kW boiler installed in 2011) and another at the Dawson City Waste Water Treatment facility (720 kW boiler installed in 2013). Each of these systems is estimated to produce approximately 10 TJ of renewable energy per year for a total of 20 TJ/year.

The amount of off-grid solar capacity was substantially increased in 2013 with the installation of a 15 kW solar electric system at Northwestel's Engineer Creek telecommunications site. Since then, Northwestel has installed three more solar power systems: north of Ross River, Watson Lake, and on the South Canol road. Each system has a capacity of 10 kilowatts and supports the communications system along the highway. Northwestel plans to continue to add new solar systems. A current estimate of 53 kW of new solar generation has been installed off-grid since 2009.

The Energy Branch continues to build capacity in solar electrical design and installation in Yukon by holding Solar PV Design and Installation Workshops: one completed in February 2014, another in September 2014 and a third in April 2015. The implementation of the Yukon's micro-generation policy in February of 2014 has also facilitated further private sector renewable energy system installations. As of October 2015, 113 kW of solar electric capacity has been added through this program and approximately 25 kW more is expected to be added soon.

Renewable transportation technologies in the Yukon have been focused on electrical vehicles and bio-diesel fuels. While the number of vehicles using these technologies is extremely small, the Energy Branch has been actively involved in research in this area. In 2009 ESC did a study that showed that operating a vehicle which had been converted to use waste vegetable oil as its primary source of fuel is viable in the Yukon. In 2013 ESC held a two-part electric vehicle conversion course.

The Energy Branch and its partners' ongoing research will continue to inform our knowledge of renewable energy opportunities in Yukon. The Energy Branch's Wind Prospecting Service is now in its sixth year and continues to add to our knowledge of Yukon's wind resource at two different sites per year. ESC's monitoring of three grid-connected Yukon solar PV installations over the past seven years has yielded data that is now guiding solar installation projects in the territory.

With funding support from the Yukon government, the Kaska Nation has completed a systematic investigation of clean energy development opportunities throughout its traditional territory over the past three years. This work identified 17 potential renewable energy projects, including two geothermal opportunities which will be the subject of further research.

The Yukon government is also interested in the potential of geothermal energy and in December 2014 the Department of Energy, Mines and Resources' Energy Branch began working in cooperation with the Yukon Geological Survey and the Canadian Geothermal Energy Association to develop Yukon geothermal favourability maps and a report that are expected to be completed by March 31, 2016. EMR is also leading the development of a geothermal policy framework.

Figure 3 highlights the progress made to date in increasing renewable energy generation in the territory.

Figure 3. Estimated progress made in meeting the renewable energy target

Sector	TJ/year	Description
New Renewable Electrical Generation	200	Mayo B Hydro Project (10 MW) and Aishihik 3rd Turbine (7 MW)
Residential Wood Heating (EPA wood/pellet heating appliances)	37	629 Appliances installed from 2009-2015
YG Building Renewable Heat	20	Whitehorse Correctional Centre Pellet Boiler (950 kW) and Dawson Waste Water Treatment Facility (750 kW)
Micro-generation Contribution	0.5	As of October 2015 a total of 113 kW of new solar generation has been added to the Yukon in new and off-grid systems. These systems produce approximately 110,000 kWh of renewable electricity per year
Total (rounded to the nearest significant digit)	**260**	**TJ/Year**

Moving beyond the target

The substantial progress made toward meeting our renewable energy target is just the beginning of the Yukon government's efforts to add more renewable energy to meet our target, and exceed it, since our energy needs continue to grow. With this in mind, the Yukon government has a number of new initiatives in the planning stages that can help us advance from our current progress in renewable energy production to beyond the 20% target.

Figure 4 is a list of some of the new targets that the Yukon government is working towards to help add more renewable energy in the territory.

Figure 4. Proposed Path to Meeting the Target		
Sector	**TJ/year**	**Description**
Residential Wood Heating (EPA wood/pellet heating appliances)	25	Approximately 83 new wood-based heating appliances per year (equivalent to current rate)
Commercial Building Renewable Heat	50	Equivalent of 5 large commercial building renewable energy boilers
Micro-generation Contribution	1	Approximately 150 kW of installed small scale Renewable Energy systems
Independent Power Production	10	Total new project development from IPPs in the range of a 1 MW project per year
Total	**86**	**TJ/Year**

There are two primary government policy tools that are required to help meet these goals for increased renewable energy production:

1. Implementation of the Independent Power Production (IPP) policy and
2. Completion of the Biomass Energy Strategy for Yukon

The Yukon government announced the adoption of the Independent Power Production policy on October 27, 2015. The policy allows private producers to generate electricity, connect to the grid and sell power to local utilities. The policy supports the participation of new independent power producers while respecting the integrity of the existing electrical system, promoting a diversified supply to meet Yukon's needs, and encouraging the development of community-based projects. Over the next year, the Yukon government will be working with ATCO Electric Yukon, the Yukon Energy Corporation and the Yukon Development Corporation to develop regulations, standards and purchase rates.

The *Yukon Biomass Energy Strategy* outlines an approach for the expansion of biomass energy use in Yukon. It discusses the challenges and benefits of increasing the use of biomass for heat using modern systems that are clean, efficient and economical. It identifies goals and principles for the use of biomass energy and proposes actions for developing and promoting this form of heat in the territory. Public consultation on the draft strategy occurred between April and June 2015. Thirty-four submissions were received from First Nations, Renewable Resources Councils, affected Yukon government departments, and the public. We incorporated feedback from the responses to ensure that biomass for energy will be harvested sustainably, and that an evolving biomass industry will not contribute substantially to territorial carbon emissions or compromise air quality.

At the same time the feedback suggests that, by cultivating a biomass industry to support energy use, Yukon government will contribute positively to local economic development and reduce the territory's reliance on imported fossil fuels.

Our target: Energy Efficiency

The 2009 *Energy Strategy for Yukon* set a target of increasing energy efficiency in Yukon by 20% by 2020.

Since 2010 the Yukon government has advanced considerably in its ability to measure and report on its energy consumption. Building heating data, electricity consumption and Yukon government fleet vehicle fuel consumption amounts are now available as seen in Figure 5 below.

The building heating fuel data and electricity consumption data is drawn from the Public Building Energy Tracker (PBET) database. Any variability in electrical use or heating fuel consumption in Yukon government buildings over the past few years will need to be verified once the database is fully evolved.

Figure 5. YG Annual Energy Consumption (Terajoules)			
	2010	2011	2012
Government Buildings	478.90	505.44	465.36
Government Fleet Vehicles	157.97	144.24	150.27
School Buses	13.68	12.65	12.07
Total	**650.56**	**662.34**	**627.69**

Figure 6 provides more detail on Yukon government buildings' energy consumption and shows a 29% decrease in electrical energy used, but the amount used for heat still varies.

Figure 6. YG Buildings Annual Electrical and Heating Energy Consumption (Terajoules)			
	2010	2011	2012
Electricity	130.27	115.40	91.89
Heat	348.63	390.05	373.46
Total	**478.90**	**505.44**	**465.36**

Yukon's electrical utilities also do a good job of tracking and reporting their electrical generation data for the entire territory, as seen in Figure 7. This is a good approximation for the Yukon's electrical demand.

Figure 7. Yukon Annual Electrical Generation (Terajoules)					
	2010	2011	2012	2013	2014
Yukon Energy Generation	1,379	1,444	1,537	1523	1447
ATCO Electric Yukon Generation	81	104	89	92	93
Total Generation	**1,460**	**1,548**	**1,626**	**1,614**	**1,541**

This allows us to calculate Yukon government's portion of electrical use in the territory, as seen in Figure 8. Note that the decrease in Yukon government's portion may correlate to an increase in electrical energy efficiency on Yukon government's part, but could also mean that other sectors' electrical consumption is simply growing marginally faster than Yukon government's.

Figure 8. YG Electrical Consumption as a Percentage of Total Yukon Electrical Demand		
2010	2011	2012
9%	7%	6%

Outside of the Yukon government and the utilities, it becomes more difficult to track energy use. The City of Whitehorse has followed the Yukon government's lead and developed its own building energy consumption database.

The Energy Branch is working with Yukon communities to develop Community Energy Plans. Such plans examine energy use holistically to balance business opportunities with energy conservation. The development of the plan is a four step process that inventories the energy use of the administrative and residential sectors, evaluates potential energy generating opportunities, projects energy consumption and its cost 20 years into the future, and proposes a strategy to balance costs while benefiting from new economic possibilities. Community engagement occurs regularly throughout the process. A plan was prepared for the Town of Faro in August 2013 and Old Crow's plan is underway. The Energy Branch is currently working to develop projections for the Kluane First Nation and will work with the Village of Haines Junction and the Champagne and Aishihik First Nations to develop an energy inventory in 2015.

How are we meeting the target?

Having energy consumption data allows us to develop a base line so that we can track the performance of energy efficiency measures that we have initiated. For example, the Energy Branch has been able to calculate an increase in energy savings due to the Good Energy Rebate program, between 2007 and 2015, as shown in Figure 9.

Figure 9. Electricity Saved Annually Due to Good Energy Rebate Program Appliance Rebates (kWh) **(Source: Good Energy Rebate Program 2007-2014 Program Reviews)**

Fiscal Year	kWh Saved
2007/08	1,487,000
2008/09	1,651,000
2009/10	2,252,000
2010/11	2,353,000
2011/12	3,109,000
2012/13	2,950,000
2013/14	3,192,000
2014/15	2,870,000

The Energy Branch and Yukon Energy Fridge Retirement program have also demonstrated energy savings: as of March 2015 the Refrigerator Retirement Program (and its predecessor, the Refrigerator and Freezer Retirement Program) have been successful in retiring 697 appliances and realizing an estimated 1,157,000 kWh in lifetime energy savings and $139,000 in lifetime client energy cost savings.

Similarly, the Energy Branch was able to calculate a 20% increase in Yukon government parking lot energy efficiency due to reprogramming the Yukon government parking lot block heater plug-ins (Intelligent Parking Lot Controllers – IPLCs). When the IPLCs were first installed in 224 Yukon government parking stalls in Whitehorse, they were left with their factory programming so that between 2003 and 2009 they saved, on average, 12% of the electricity that would have been consumed if regular plug-ins had been used. In 2009 ESC staff reprogrammed the IPLCs and the savings jumped to 32% when compared to the 2009 savings, and this 20% increase in savings continues.

It should be noted that measuring energy efficiency is not as simple as showing a decrease in energy use over time. Energy efficiency can increase, while total energy consumption also increases, because the total energy used is greater than the efficiency measure's reductions. For example, from Fiscal Year 2011/12 to Fiscal Year 2012/13, the "Keys" program used by the Yukon government's Fleet Vehicle Agency shows a decrease in Yukon government's fleet fuel consumption from 15.9 to 15.6 litres per 100 km driven, but the fleet's total fuel consumption increased by 32,000 litres due to more kilometres being driven. This pattern was repeated from Fiscal Year 2012/13 to Fiscal Year 2013/14 when the fuel consumption decreased from 15.6 to 15.3 litres per 100 km driven, but the fleet's total fuel consumption increase by 28,000 litres, again due to more kilometres being driven. See Figure 10.

Figure 10. YG Fleet Vehicle Fuel Efficiency

Fiscal Year	2010/11	2011/12	2012/13	2013/14
Total Kilometers driven (000's)	6,969	6,536	6,873	7,197
Litres of fuel consumed (000's)	1,127	1,039	1,071	1,099
Consumption in litres per 100 km	16.2	15.9	15.6	15.3

While tracking fleet vehicle energy efficiency is not as simple as it first appears, tracking building energy efficiency is even more complicated due to the combination of activities (heating, lighting, ventilating, operating appliances and electronics, etc.) taking place in buildings. These activities foster the use of a mix of energy resources that vary from building to building. For example, electricity is used for many non-heat processes, but also often for some or all heat processes; oil is used for heating, propane may be used for heating or cooking, wood may be used to supplement heating or provide all heating. The amount of heat required by any given building is based on the difference in temperature required indoors and the varying outdoor temperatures, the size of the building and the quality of the building's construction. It is clear that to effectively track the energy consumption of Yukon buildings it is necessary to track much more than the energy each building consumes.

In addition, beyond measuring the uptake of energy efficiency programs that demonstrate behavioural change, assessing actual energy savings in private homes requires surveys and access to clients' energy bills before and after program participation. (One example of a behavioural focused program is the Energy Branch's QuickStart Energy Kits. Through these kits, ESC delivers energy efficiency information and products to renters.)

What got us to this point?

Although not all of the energy savings have been, or can yet be tracked, the Yukon government has a number of projects underway that should result in increased energy efficiency in the future.

Detailed energy audits have been performed on seven Yukon government buildings with high energy consumption: Copper Ridge Place, Andrew A. Philipsen Law Centre, Main Administration Building, Education Building, Yukon College (Ayamdigut Campus), Elijah Smith Elementary School, and Porter Creek Secondary School.

As a result of the audits, energy conservation measures at Copper Ridge Place and the Law Centre are nearly complete. Copper Ridge retrofits include enhanced heat recovery and more efficient fan ventilation in the day care, kitchen and administration areas. Law Centre retrofits include chiller unit replacement, lighting upgrades and fan operation adjustments. These conservation measures are anticipated to save approximately $220,000 in energy costs per year. The Main Administration Building will undergo upgrades to its windows and wall insulation in 2015/2016 and planning is underway for upgrades at Yukon College (Ayamdigut Campus).

The Yukon government has recently virtualized 95% of its server infrastructure and plans to virtualize 80% of its desktop computers. Virtualization allows the system administrators to use software to emulate physical servers and computers. This reduces the total number of physical devices required to deliver the IT needs of Government, resulting in significant energy savings. The new servers result in an energy savings of approximately 1.14 GWh/year which is about 0.3% of Yukon's total electrical demand.

The Department of Education completed a public transit pilot project with two Whitehorse high schools which it has now expanded to all Whitehorse high schools. Students can choose to either take advantage of a free bus pass for the public transit system or continue using the school buses. In the fall of 2014, Education also began using new school bus route optimization software. These two programs are working to improve school bus efficiency and encourage a life-long use of public transit.

Since 2012, the Yukon Housing Corporation has built 172 new highly energy efficient housing units to bring their total number of EnerGuide 85 (or better) rated units to 224. Yukon Housing has been reducing the size of their new units so that not only do they have higher energy efficiency ratings, but they also have less volume to heat. This approach results in savings on an ongoing basis over the life-time of each of these units. This reduces the Yukon government's energy use for new buildings and sets a new standard and provides examples for the industry to follow. This has had a significant impact in the demand for more energy efficient housing; since Yukon Housing began building to such high standards hundreds of privately built housing units have been built to far exceed current energy standards. Yukon Housing continues to undertake research into new housing-related energy efficiency technologies and provide technical support and training to builders, home owners and related professions, who wish to either construct new homes or to retrofit existing homes to meet and exceed energy efficiency standards.

Energy Branch programs such as its rebate and IPLC programs have already shown energy efficiency increases of 20% and more. The Fleet Vehicle Agency's energy efficiency reporting shows that the fuel efficiency of the fleet on a per vehicle fuel economy basis has recently increased by 2% and the agency continually strives to improve the fuel efficiency of its fleet. To more effectively track the energy savings of government projects from all Government of Yukon departments, the Energy Branch has developed a new data base called the Interdepartmental Energy Project Tracker (iPET). iPET is a central and standardized tool to input, track and accurately report on the progress of energy-related projects in which the Yukon government is leading, funding and/or otherwise engaged. iPET tracks energy saved, produced and greenhouse gas emissions reduced for each project in the data base. iPET is currently being tested by ESC in cooperation with other Yukon government branches.

Outside of government, we have very little data from which to track our progress towards the Energy Strategy energy efficiency target. However, given the success of the Energy Branch's programming, it is clear that well designed energy efficiency measures are successful. Continuing and expanding these programs will increase our likelihood of reaching our target. The Climate Change Secretariat (ENV), Bureau of Statistics (ECO) and Energy Branch (EMR) are working to a develop a cross-sector, made-in-

Yukon energy use and emissions report, ensuring accurate data collection to better inform policy decisions and program design.

How do we close the gap?

The Energy Branch has undertaken two major new expansions to its *Good Energy* rebate program: The Residential Energy Incentive, which launched January 1, 2015 and the Commercial Energy Incentive which launched May 1, 2015. The Residential program is aimed at increasing the energy efficiency of new and existing Yukon homes through incentives to improve building envelopes. It is modelled on the most common examples found in other jurisdictions, with new home incentives being based on an appropriate EnerGuide rating level, and retrofits being based on the level of building improvement as calculated through EnerGuide qualified auditing of the building (before and after construction). In its first six months the Residential program has seen 34 new homes being built to EnerGuide 85 or better resulting in future estimated annual thermal energy savings of 176,800 kWh and annual cost savings of $30,600.

The Commercial program is aimed at improving energy use in multi-family dwellings and commercial buildings. The incentive targets two areas. The first component directly assists Yukon apartment and condominium owners in retrofitting their buildings to improve energy performance and reduce energy consumption, costs and emissions. The second targets the lighting efficiency of commercial buildings by encouraging owners to upgrade to energy-efficient and long-lasting LED lighting systems. In its first summer the Commercial program has resulted in upgrades to LED lighting in 10 commercial buildings, including hotels, a curling rink and a vehicle service centre. These upgrades should result in future annual energy savings estimated at 1,188,000 kWh and annual cost savings estimated at $142,500.

The Energy Branch and its partners, the electrical utilities, the Yukon Research Centre and the Yukon Housing Corporation, continue to investigate new ways to increase energy efficiency that will inform future programming. Currently three technologies are being evaluated to assess their potential in Yukon: Electrical Thermal Storage (ETS), Vacuum Insulated Panels (VIPs) and commercial LED lighting.

ETS is a form of electric heating that incorporates storage technology. Initial results from a Yukon study show that this technology is economical, especially when combined with time of use rates, rebates or grants.

VIPs are a form of thermal insulation consisting of a nearly gas-tight enclosure surrounding an evacuated core. They provide better insulation performance than conventional insulation materials. A three-year pilot completed in Whitehorse found that VIPs were effective at reducing heat loss and had no failures or drop in insulation value over the three years. A second study is being conducted in Haines Junction.

Commercial LED lighting has been installed and tested in various buildings and street lights in Yukon. This lighting is resulting in energy savings as well as improved lighting, and increased user satisfaction.

The new FH Collins High School has been built with the goal of achieving Leadership in Energy and Environmental Design (LEED) Silver Certification. It is estimated that it will use 28% less energy than the Ashrae 90.1-2007 standard[2]. In 2016/17, the Department of Education will upgrade the windows at the Teslin Community School.

[2] (Ashrae 90.1-2007 is a US standard that provides minimum requirements for energy efficient designs for buildings except for low-rise residential buildings)

There are also plans to complete lighting retrofits in all schools that still have T12 fluorescent lights. As well, the Departments of Education and Highways and Public Works worked together to perform energy audits on existing schools to learn about the most effective energy savings measures. Recommendations are being reviewed and the departments will proceed with implementation where feasible.

LEED standards provide a globally recognized brand for energy performance and the Yukon government has adopted LEED design on recent projects. Going forward, HPW is also developing a building construction best practices manual that will incorporate Yukon-appropriate energy efficient design and performance and, where feasible, the application of LEED standards for future government projects

Highways and Public Works will be developing a communications plan that targets reductions in energy use in Yukon government buildings through the actions and initiatives of staff who occupy these buildings. Savings for Yukon government buildings will be tracked by Highways and Public Works in the PBET.

Our Goal: Yukon Oil and Gas Development

The 2009 *Energy Strategy for Yukon* set a goal to support the development of Yukon oil and gas resources for use within Yukon and for export.

Development of local oil and gas resources needs to be done in a way that will deliver the greatest economic benefits to Yukoners, while protecting the environment.

Yukon's oil and gas regulatory regimes need to be clear, consistent and competitive with other jurisdictions, while also providing for sustainable, responsible development of Yukon's resources.

How are we meeting the goal?

Yukon has had limited oil and gas exploration in the past 60 years. Seventy six wells have been drilled to date, mostly in the 1960s and 70s. There are proven resources but they are in remote areas with limited access. Our goal is to lay a strong foundation for industry by providing a sound regulatory regime, more baseline data, enhanced public education and outreach and improved infrastructure such as road access. This foundation may enable developers to overcome challenges such as distance to market.

From 1978 to 2012, gas from the Kotaneelee wells generated almost $46 million in royalties. Since 2009, more than $100 million have been spent by oil and gas companies on exploration projects, with more than $20 million of that money creating direct socio-economic benefits to Yukoners. Four exploration wells have been drilled in the Eagle Plain basin since 2009. In 2012-14, seismic data was collected in the Eagle Plain basin which will help support a current proposal for up to 20 new wells in the same area.

Liquefied Natural Gas (LNG) is becoming a popular fuel source for electrical power production. Replacing diesel with cleaner burning LNG may decrease greenhouse gas production. The two Yukon public utilities have had LNG facilities licenced, although only the Yukon Energy Corporation's (YEC) project has proceeded to the operational stage. Other industries, particularly off-grid mines are looking to LNG as a source of energy for electrical generation and operation of heavy equipment. LNG from southern British Columbia is the fuel source for YEC's LNG electrical generators. A Yukon source of LNG could reduce the need to import LNG.

Yukon has a mandate to negotiate a deal with Canada on shared management and revenues for offshore (Beaufort) oil and gas. Work is underway to prepare for negotiations with Canada. Development of offshore oil and gas could bring large socio-economic benefits to Yukon.

What got us to this point?

The Oil and Gas Resources (OGR) branch of the Yukon government has been continually developing and modernizing oil and gas regulations to achieve clarity, certainty, and transparency. In 2013 a *Gas Processing Plant Regulation* was enacted which allows Yukon to regulate LNG facilities. Since that time, EMR has licenced two facilities which will use LNG for power generation. OGR is designing regulatory directions to minimize greenhouse gas emissions in the oil and gas sector (i.e. flaring, venting and leaks). EMR is working on Best Management Practices (BMP) to apply to all resource development projects which will help to mitigate the environmental impacts of exploration and development. Oil and gas development is included. OGR is committed to the timely review and completion of decision documents, benefits agreements and licence applications.

The Yukon Legislative Assembly formed the Select Committee Regarding the Risks and Benefits of Hydraulic Fracturing in May 2013. Yukon government responded to the Committee's report on April 9, 2015 by accepting all 21 of its recommendations.

In response to the Select Committee Regarding the Risks and Benefits of Hydraulic Fracturing, the Yukon government will implement an action plan to address matters relating to oil and gas development in Yukon. The action plan will include existing activities and new projects that will help the Yukon government gain a greater understanding of the impacts and benefits of oil and gas development (including shale gas development) and safely regulate any future projects. The Yukon government is confident that its action plan will yield valuable information and data that will benefit many of the territory's resource development industries, as well as better inform government in its resource management decisions.

OGR continues to collaborate and develop service agreements with other regulators (i.e. the National Energy Board and the British Columbia Oil and Gas Commission). The service agreements give our small jurisdiction access to expert regulators with current experience in specialized areas, something it is difficult to maintain locally.

Yukon Geological Survey (YGS) continues regional mapping and geological assessment of our oil and gas basins to better understand their resource potential. YGS collaborates with British Columbia, Northwest Territories and Alaska geological surveys groups in areas where basins overlap our jurisdictions. The studies support exploration efforts and land and resource management decisions.

Ongoing projects that have supported oil and gas development are:

- OGR published a study in 2011 on LNG and natural gas pipeline potential in Yukon. EMR also supported two related studies by First Nations which examined natural gas production potential in northern Yukon.
- EMR and Environment have collaborated to create new water baseline data stations to support water management decisions for resource development in Eagle Plain and Liard basins.
- EMR supported the Canadian Energy Research Institute (CERI) in the publishing of an independent report to reflect the potential and current effect of conventional natural gas development on Yukon's economy.

- Yukon government is improving access to Yukon oil and gas information by creating a dedicated Oil and Gas Viewer web application.

How do we close the gap?

Oil and gas exploration and development is heavily influenced by global energy prices. In order to compete with other jurisdictions, Yukon government will promote exploration and production through an efficient and effective regulatory regime, collection of more baseline data, and increased public engagement on the benefits of responsible resource development.

The ongoing improvement of Yukon's regulatory regime will enhance clarity, transparency and fair treatment. The regime should be competitive with other Canadian jurisdictions, taking the remote frontier reality of Yukon into account. Continuing to collaborate with other jurisdictions will assist in this objective. Regulations with a goal-oriented approach build in flexibility so industry can use the latest methods.

Yukon government will continue to maintain or expand the basin area available for exploration. Only 15% of Yukon is considered an oil and gas basin. Less than 5% of Yukon is available for disposition. It is important to ensure as much basin as possible is accessible, while respecting environmental and social values. Yukon will also consider improving infrastructure which supports resource industries.

OGR will continue to engage First Nations through dialogue and consultation. This will include a continued effort to create a common regulatory regime on First Nation and Yukon government land and negotiation of benefit agreements.

OGR is proposing to lead a discussion on oil and gas development in Yukon. The goal is to increase public understanding of the oil and gas sector and of Yukon government's ability to safely regulate oil and gas activities.

Yukon will gather more baseline water data to support safe development and continue collecting geological baseline data in areas with the most potential.

Summary and Next Steps

Through its 53 stated Priority Actions, the 2009 *Energy Strategy for Yukon* has provided valuable guidance to energy policy development and energy management in Yukon for the past six years. This guidance has helped Yukon government in making steady and substantial progress towards its targets. The following is a complete list of all the priority actions from the Strategy showing the status of each:

- A "Completed" status means that the priority action has been completed.
- An "In Progress" status means that this is a long-term program, such as the *Good Energy* program, or a long-term set of actions that the Yukon government will continue to do as part of its usual operations.
- A "Reassessing" status means that this priority action is, or is recommended to be, assessed within the current context and environment.

		Status		
	Priority Action	**Completed**	**In Progress**	**Reassessing**
1	Increase energy efficiency in Yukon by 20% by 2020.		✓	
2	Reduce energy consumption in Yukon buildings.		✓	
3	Improve access to energy efficiency evaluations by providing training for energy evaluators.		✓	
4	Provide incentives to building owners to carry out retrofits.		✓	
5	Promote energy efficiency for new buildings.		✓	
6	Pilot heat pumps and other heating technologies in Yukon homes and monitor effects on energy consumption and prices.		✓	
7	Reduce energy consumption for transportation in Yukon.		✓	
8	Invest in agriculture infrastructure to support production of Yukon grown food.	✓	✓	
9	Undertake a study of the transportation sector to identify strategic opportunities for efficiency and conservation.	✓	✓	
10	Develop programs to encourage efficient transportation.		✓	
11	Promote the use of energy efficient products by providing incentives for products that meet energy performance standards.	✓	✓	
12	Improve energy efficiency for Yukon government operations.		✓	
13	New building construction funded by government will meet energy efficiency standards.		✓	
14	Standards for the government's vehicle fleet will set targets for vehicle use and fuel consumption.		✓	
15	A green procurement policy for government will consider environmental performance of goods and services.	✓	✓	
16	An environmental stewardship initiative will advance environmental and energy stewardship within Yukon schools.	✓	✓	
17	Increase renewable energy supply in Yukon by 20% by 2020.		✓	
18	Develop a policy framework for geothermal energy.		✓	
19	Support and demonstrate renewable energy projects in communities off the electrical grid to reduce diesel use.	✓	✓	
20	Support the development of a wind, hydro, solar, wood or geothermal project in a diesel-powered community.	✓	✓	
21	Conduct pilot studies to assess the feasibility of renewable energy initiatives.	✓	✓	
22	Pilot studies of new or expanded district heating systems.	✓		
23	Install a solar powered irrigation system for a community farm.	✓		
24	Install wood fuelled heating systems in institutional buildings.	✓	✓	

	Priority Action	Status		
		Completed	In Progress	Reassessing
25	Promote renewable energy sources for heating and transportation.		✓	
26	Provide financial incentives for renewable energy initiatives.		✓	
27	Provide training and technical assistance to build local skills for renewable energy production.	✓	✓	
28	Support strategic investments in infrastructure to increase the supply of electricity from renewable sources.		✓	
29	Enhance existing hydroelectric infrastructure.	✓	✓	
30	Develop new sources of hydro, wood, wind or geothermal energy.	✓	✓	
31	Assess the feasibility of expanding the Yukon transmission system to connect to other communities, industrial projects or jurisdictions.	✓	✓	
32	Connect the two Yukon electrical grids by completing the Carmacks to Stewart transmission line.	✓		
33	Update and develop a policy framework for electricity that emphasizes efficiency, conservation and renewable energy.		✓	
34	Facilitate the purchase of electricity from independent power producers.		✓	
35	Allow individuals to connect renewable energy sources to the grid.	✓	✓	
36	Develop and implement demand management programs and incentives to promote energy efficiency and conservation.	✓	✓	
37	Support research and development of technologies and policies that will optimize the use of hydroelectricity.	✓		
38	Consider appropriate roles, responsibilities, and corporate structure for Yukon Development Corporation and Yukon Energy Corporation to ensure effective management and operation, and optimize the efficiency and reliability of electricity generation and distribution.	✓	✓	
39	Support strategic opportunities to replace imported diesel fuel with Yukon's oil and gas resources.	✓		
40	Support a small-scale oil refinery or liquefied natural gas processing plant		✓	
41	Support access to natural gas energy from the proposed Alaska Highway Pipeline or a smaller pipeline in Yukon.			✓
42	Develop a competitive and comprehensive oil and gas regulatory regime which will emphasize performance-based compliance.	✓	✓	
43	Establish new pipeline regulations under the *Oil and Gas Act*.		✓	
44	Update best practices for environmentally responsible oil and gas exploration and development.		✓	
45	Develop best practices for minimizing greenhouse gas emissions in the oil and gas sector.	✓	✓	
46	Prepare for northern pipeline development such as the Alaska Highway Pipeline.			✓

	Priority Action	Status		
		Completed	In Progress	Reassessing
47	Promote private sector investment in the development of Yukon's oil and gas resources.	✓	✓	
48	Finalize and implement an agreement with the federal government for sharing management and revenues for offshore oil and gas.	✓	✓	
49	Assess new and existing energy sources that could be developed in Yukon.	✓	✓	
50	Consider the economic, environmental and social implications of these sources.	✓	✓	
51	Compare the costs and benefits of the energy choices.		✓	
52	Hold public consultation on a policy framework for coal bed methane, coal and nuclear power before permitting any development.			✓
53	Monitor implementation of the Energy Strategy and report regularly on progress. The first progress report will be released by the end of 2010.	✓	✓	

New Initiatives

As Yukon government looks to the future it will be important for us to continue with most of these priority actions as well as to develop new actions for areas that have emerged since 2009 when the Strategy was approved. These areas include:

- Next Generation Hydro - In November 2013, Yukon government directed the Yukon Development Corporation (YDC) to plan one or more hydroelectric projects to ensure an adequate and affordable supply of reliable and sustainable electrical power in Yukon. YDC is conducting research, producing technical papers, and engaging with First Nations and other Yukon residents regarding the project. YDC will be making its recommendations to Yukon government in 2016.

- Alaska-Yukon Economic Corridor - In October 2013, the governments of Yukon and Alaska signed a Memorandum of Understanding to assess the feasibility of developing electrical and telecommunication connections between Yukon and southeast Alaska. A report released June 26, 2015 concludes that the economics of a telecommunication connection is independent of electrical transmission. The findings also conclude that an electrical connection, while technically and economically feasible, is initially dependent on the growth of power consumption in the Municipality of Skagway. Cruise ships purchasing electricity while in port would be key future customers. The report states that a cross-border electrical connection, once established, could enable development of additional power generation along the transmission corridor, including possible hydroelectric generation at West Creek, a project currently being explored by Skagway. The report findings will be used by municipalities, businesses and utilities in planning for the energy and telecommunication needs of this binational region.

- Oil And Gas Development - The Yukon Legislative Assembly formed the Select Committee Regarding the Risks and Benefits of Hydraulic Fracturing in May 2013. On March 8, 2015 the Yukon government responded to the Committee's report by accepting all 21 of its recommendations. Yukon government is open to responsible shale gas development opportunities in Yukon, but only in the Liard sedimentary basin. A key element of the government's position is that any proposed hydraulic fracturing activity would require the support of affected First Nations. The government's response to the report includes: developing an engagement strategy, conducting an economic study, expanding the groundwater monitoring and seismic baseline data, and seeking expert advice to confirm that baseline information is adequate and that regulatory processes will protect human health and the environment.

- Community Energy Planning - Yukon First Nations reported a need for community energy plans in the 2011 *Yukon Energy Corporation First Nations Energy Summit.* Yukon municipalities noted a similar need in the 2012 *Our Towns Our Futures* report completed by Community Services. Community energy plans enable Yukon communities to evaluate their energy consumption and costs and determine the best methods for reducing both. The identified solutions can involve either improved energy efficiency or utilizing new energy sources and infrastructure. In either case, the vision of Yukon community energy plans is to reduce community energy spending so that the revenue saved can be utilized to support social programs or new infrastructure development, providing benefits for the community. The plans therefore focus on the economics of energy, infrastructure development and renewal, and improving energy literacy in Yukon's communities.

- Keno City to Mayo transmission line upgrade- Yukon government is investing up to $5.3 million for permitting and preliminary engineering to replace aging transmission infrastructure between Keno City and Mayo. The project will also upgrade the transmission line from Stewart Crossing to Keno City from 69 kV to 138 kV, improving system reliability and providing for future economic growth.